CUE DOT GENERATOR GE1/536

Introduction

The GE1/536 accepts 625-line mixed sync pulses and produces two separate outputs: a blanking signal and a cue dot signal[1].

The two outputs are both generated in lines 36 to 43 and 349 to 356. The blanking signal consists of a negative-going rectangular pulse of about 1·5 μs duration starting approximately 1·75 μs after the end of line blanking. The cue dot signal coincides with the blanking signal and consists of two positive-going pulses of about 0·5 μs duration separated by 0·5 μs. The effect of imposing the blanking signal and inserting the cue dot signal on a video signal is to introduce a white-black-white combination of vertical bars in a small area at the top left-hand corner of the picture derived from the video signal.

The generator is constructed on a CH1/12A chassis and contains its own mains-fed power supply circuits.

General Specification

Line Standard	625
Input Signal	2 V p-p mixed sync pulses
Input Impedance	3 kilohms approx.
Blanking Output	2 V p-p across 75 ohms
Cue Dot Output	0·7 V p-p across 75 ohms
Output Impedances	75 ohms ±2%
Ambient Temperature	5 to 45 °C
Power Input	
Voltage	200 to 250 V, 50 Hz
Consumption	40 mA at 240 V
Weight	1 lb. 12 oz.
Connector	15-pole Painton plug
Index-peg Positions	11 and 44

Circuit Description

The waveform generation and power supply circuits of the GE1/536 are shown in Figs. 3 and 4 respectively. Idealised circuit waveforms, with their timings related, are illustrated in Figs. 1 and 2.

1·5-μs Pulse Generation and Gating

The applied mixed sync pulses appear at TR2 collector inverted and clipped to about 4·5 volts p-p. The sync pulses are inverted again by TR3 and fed to a counter chain, IC1 to IC6, which is subject to an inhibiting voltage from IC8a. Output from TR2 is also fed to TR1 and IC9a.

Integrated circuits IC9a and IC9b, basically bistable, are both converted to monostable action by components connected to them externally. The positive-going leading edge of each inverted sync pulse triggers IC9a. At the end of an active cycle of about 12·25 μs the output of IC9a, differentiated, triggers IC9b. The waveform from IC9b is a negative-going 1·5-μs pulse.

The 1·5-μs pulses, inverted by TR4, and the positive-going mixed sync pulses from TR1 (each signal at about 4·5 volts p-p) are applied to the gate IC10a. Coincidence in these two inputs only occurs in the five broad sync pulses at the start of a field. Then, five 1·5-μs negative-going pulses are fed to pin 10 on IC7. The first causes IC7, which is bistable, to take up a state giving a negative-going output. (The following four pulses do not affect IC7.) The output of IC7 is inverted by IC8a.

The positive-going voltage from IC8a, initiated during the first field sync broad pulse, is applied to each of the binary counter stages IC1 to IC6 and permits this chain to count the mixed sync pulses from TR3. The remaining broad pulses, the equalising pulses and line sync pulses are counted until, at a total of 64 pulses into the counter chain, the output of IC6 completes one cycle with a negative-going transition. This, applied to pin 2 on IC7, reverses the states of IC7 and IC8a. The stages IC1 to IC6 then receive a negative-going signal from IC8a and counting is inhibited for the remainder of that field.

From pins 6 and 12 on IC4 and IC6, and pins 3 and 9 on IC5, in the counter chain, signals are fed to the gate IC8b, which also receives 1·5-μs pulses from TR4. While the counter chain is counting the 64 mixed sync pulses following an initial broad pulse, between the 40th and 48th pulses the signals from IC4, IC5 and IC6 to IC8b are all positive-going. As a result an output of eight negative-going 1·5-μs pulses (each 12·25 μs after the leading edge of line sync) is obtained from pin 8 on IC8b. These are inverted by IC10b.

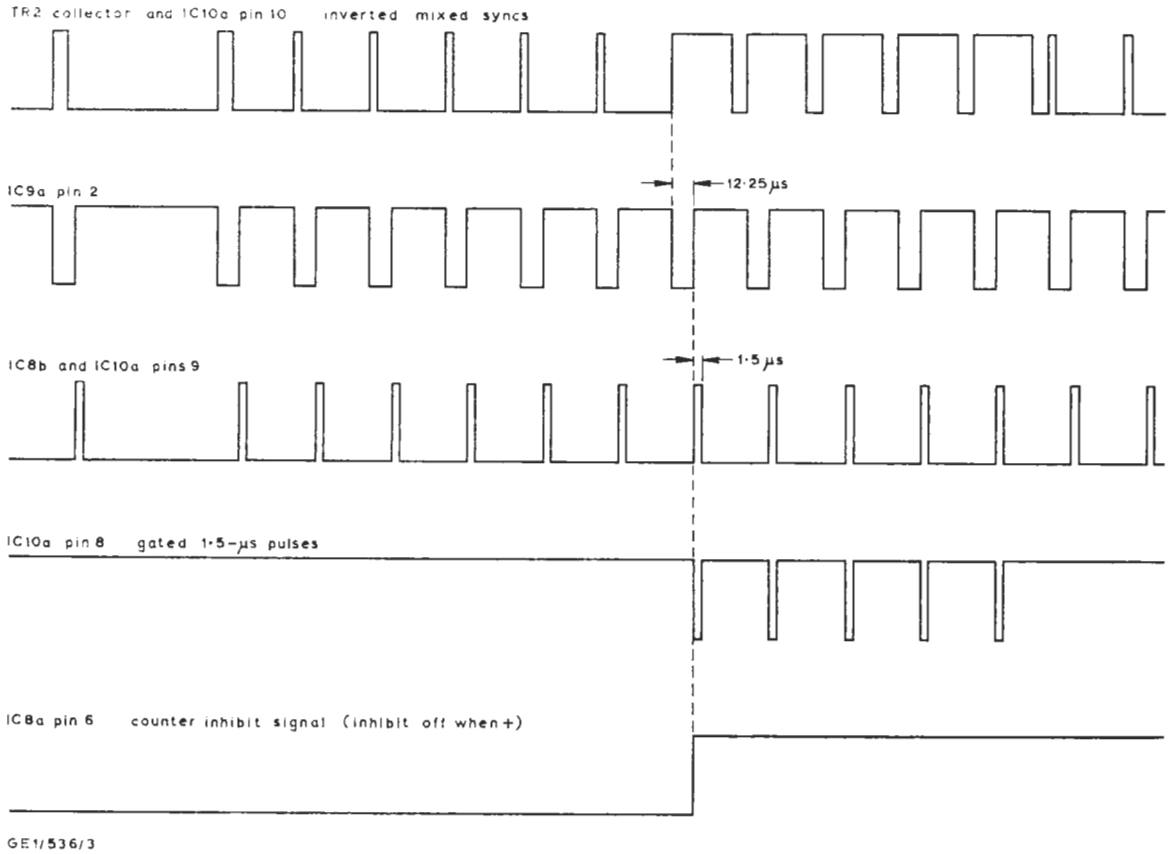

Fig. 1 Waveforms Showing Timing of 1·5-µs Pulses and Removal of Inhibit Signal from Counter Chain

Blanking and Cue Dot Outputs

The series of eight pulses from IC10b are clipped and again inverted by TR5. The pulses are 2 volts p-p at the junction of R19 and R22. The following stages, including TR6, TR7 and TR8, over which there is negative feedback, create a low source impedance; consequently the output impedance at which negative-going 1·5-µs blanking pulses are produced by the unit is largely determined by R31 (75 ohms). If the load is 75 ohms, the voltage gain from R22 to the output connector is 0 dB and the blanking output is 2 volts p-p.

The negative-going 1·5-µs pulses from TR5 are also fed to IC11. External components connected to IC11 make it a multivibrator that is free-running during the application of a negative-going waveform to pin 6. The values of the external components (particularly R35) are chosen so that during each 1·5-µs negative-going pulse at pin 6, the output at pin 4 consists of two positive-going rectangular waves, each about 0·5 µs in duration, separated by about 0·5 µs. This is the cue dot waveform and is produced at the output connector after passing through the stages containing TR9, TR10 and TR11. Negative feedback is fed over these stages and the output impedance is largely determined by R48 (75 ohms). If the load is 75 ohms, the voltage gain from the junction of R36 and R39 to the load is 0 dB and the output is 0·7 volt p-p, as set by the value of R36.

C13, in conjunction with R36, R37 and R38, lengthens the times of rise and fall and so limits the bandwidth of the cue dot output.

Power Supplies

In the power supply circuits, one series stabilising stage provides current at 11·3 volts, and this is followed by a second which provides output at 5

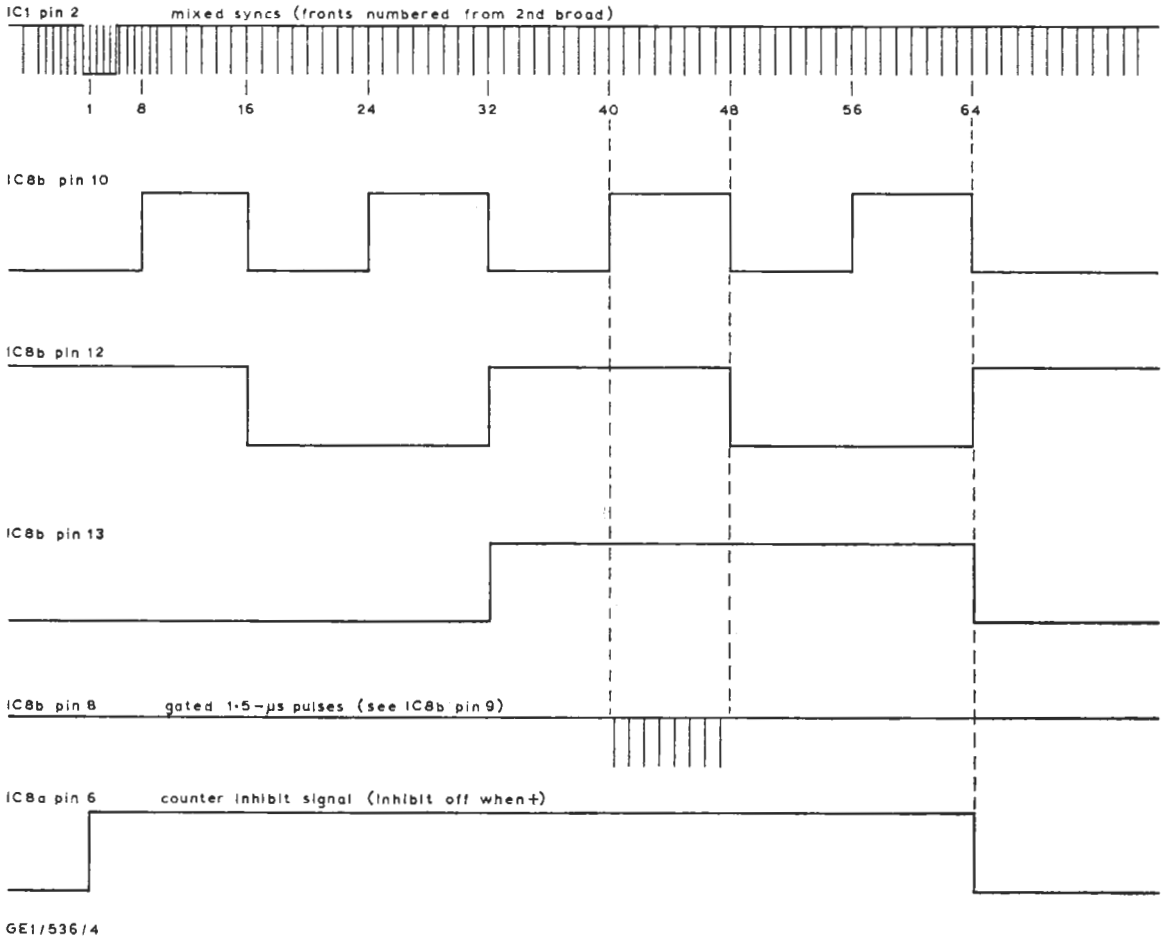

Fig. 2 Waveforms Showing Timing of Output and Restoration of Inhibiting Signal to Counter Chain

volts. The arrangement of these circuits is such that power sources at +5 volts and −6·3 volts are formed.

Maintenance

Apparatus Required

Avometer Model 8

Oscilloscope, with dual trace facility and with low capacitance probe, having not greater than about 30 ns rise time overall (e.g., Tektronix type 535, 545 or 546, with plug-in unit 1A1, 1A2 or CA, and x10 probe).

Two 75-ohm terminating resistors.

General

For maintenance tests the GE1/536 must be fed with an a.c. mains supply and mixed sync pulses at 2 volts p-p, and at the same time the unit must be accessible.

To meet these requirements, fit the GE1/536 on a chassis extender CH1A/3 mounted where the generator is normally installed. Alternatively, bench-test the generator, making the necessary connections to it using a free 15-pole Painton socket.

Power Supplies

Apply 240 volts, 50 Hz, to the generator. Measure the voltages across C22 and C21. These should be 11·3±0·2 volts and 5·0 ±0·1 volts respectively. If necessary (e.g., owing to component replacement in the power supply circuits) bring the voltage across C22 within the specified limits by connecting a resistor in shunt with R54 or R55, and similarly

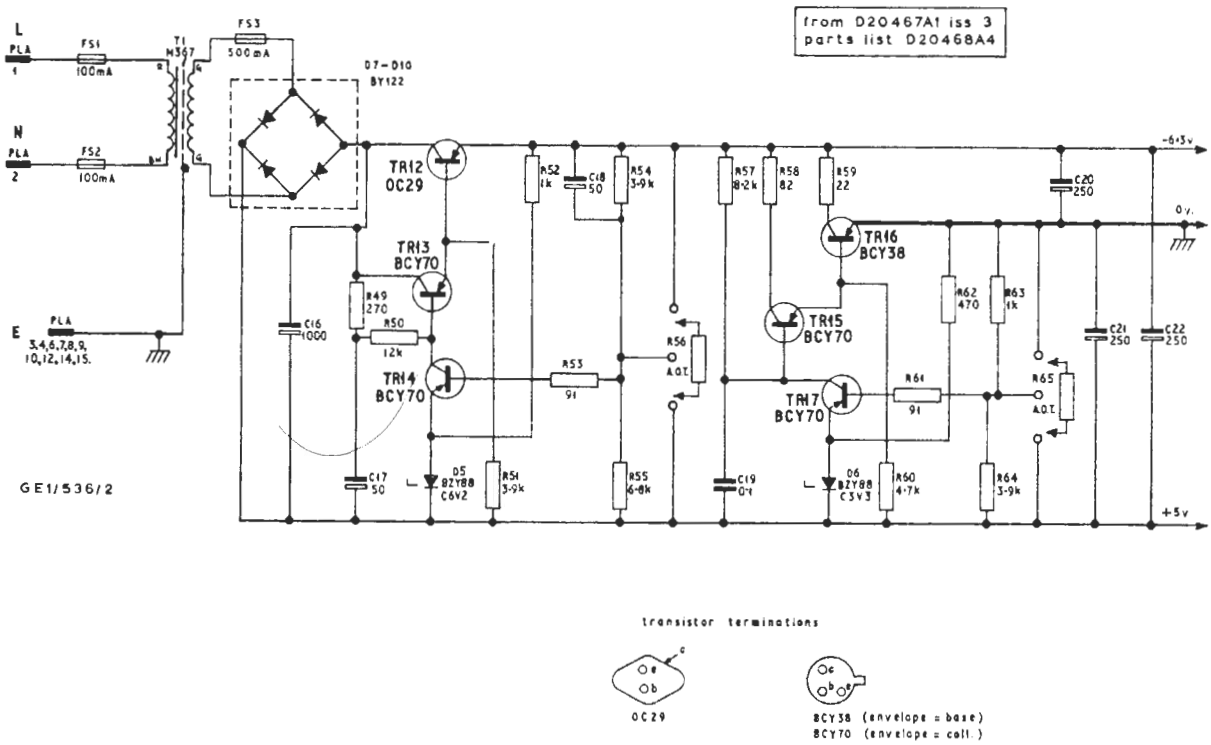

Fig. 4 Power Supply Circuits

correct the voltage across C21 by shunting R63 or R64. In each instance, the value of the shunt resistor must be found experimentally, commencing with a relatively high value. Shunt resistors previously fitted may have to be removed.

Timing of Outputs

If IC9, or a component connected to it, has been changed, examine the output at pin 2 of IC9.

The waveform should be a negative-going pulse, about 0·8 volt p-p, that has a duration of 12·25 ±0·25 μs. Its leading edge should coincide with that of the applied sync waveform (including the leading edge of each broad pulse and equalising pulse). To bring the pulse duration within the limits quoted, modify the value of R66.

Blanking Output

The output at pin 11 on the 15-pole connector of the generator should be eight pulses per field that have a waveform as described in the Introduction.

With a load of 75 ohms, the amplitude of the output pulses should be 2·0 ±0·2 volts p-p, their rise and fall times should be less than 200 ns, and the level between pulses should be 0 ±150 mV relative to earth.

Check that the leading edge of each cue dot blanking pulse follows about 1·75 μs after the trailing edge of line blanking, providing that a correctly timed source of mixed blanking is available. Otherwise, confirm that the cue dot blanking pulse follows 12·25 μs after the leading edge of line sync.

Cue Dot Waveform and Output

If IC11, or a component connected to it, has been changed, examine the waveform at the junction of C12 and R36. Use the probe with the oscilloscope.

The waveform, recurring in eight lines per field, should correspond to the cue dot output described in the Introduction. If necessary, modify the value of R35 so that the positive-going pulses in the waveform, and the separation between them, all have about the same duration, giving approximately a 1:1 mark-space ratio.

The output at pin 13 on the 15-pole connector of the generator should have a similar waveform to that obtained at the junction of C12 and R36.

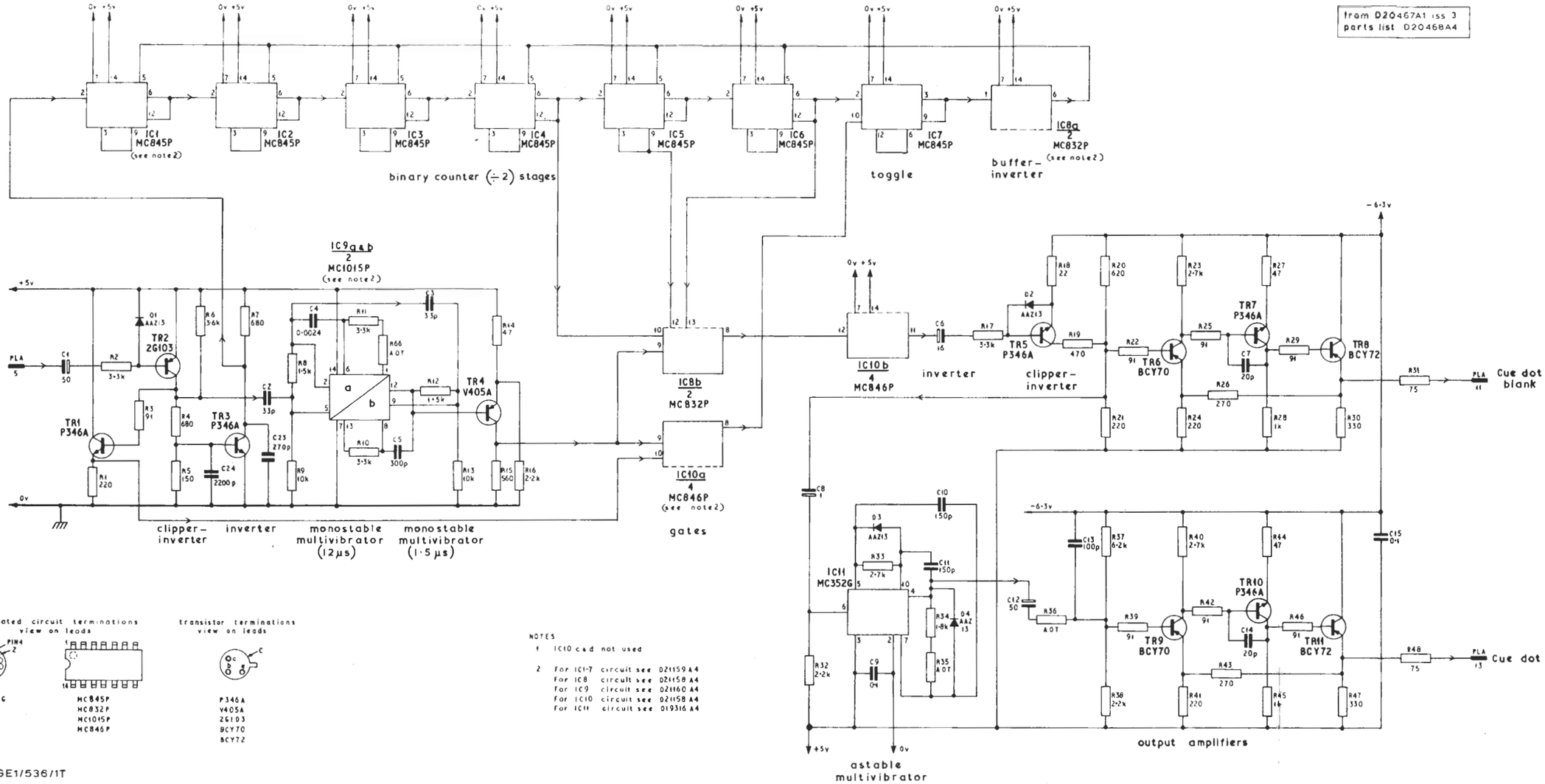

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Fig. 3 Waveform Generation and Output Circuits

With a load of 75 ohms the output should be 0·7 volt p-p, and if necessary R36 should be re-selected (from preferred values) to obtain this amplitude as nearly as possible. The interval between each pair of positive-going pulses should have a level above the base of the pulses not exceeding 15 per cent of the p-p amplitude of the pulses. The level between complete cue dot waveforms should be at 0 $\pm$150 mV relative to earth.

References

1. Sync Pulse Stabilising Amplifier AM18/513C
2. Designs Department Specification No. 8.289(68)

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